Calibration Exercises

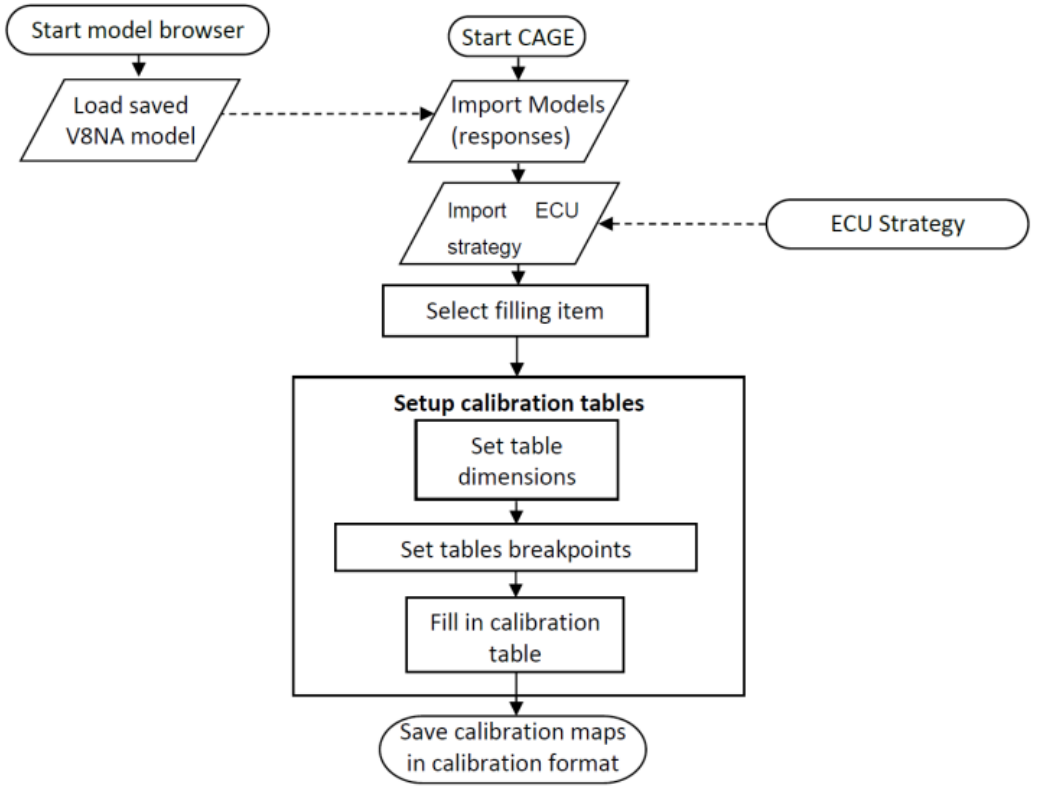
Introduction

Calibration Exercises

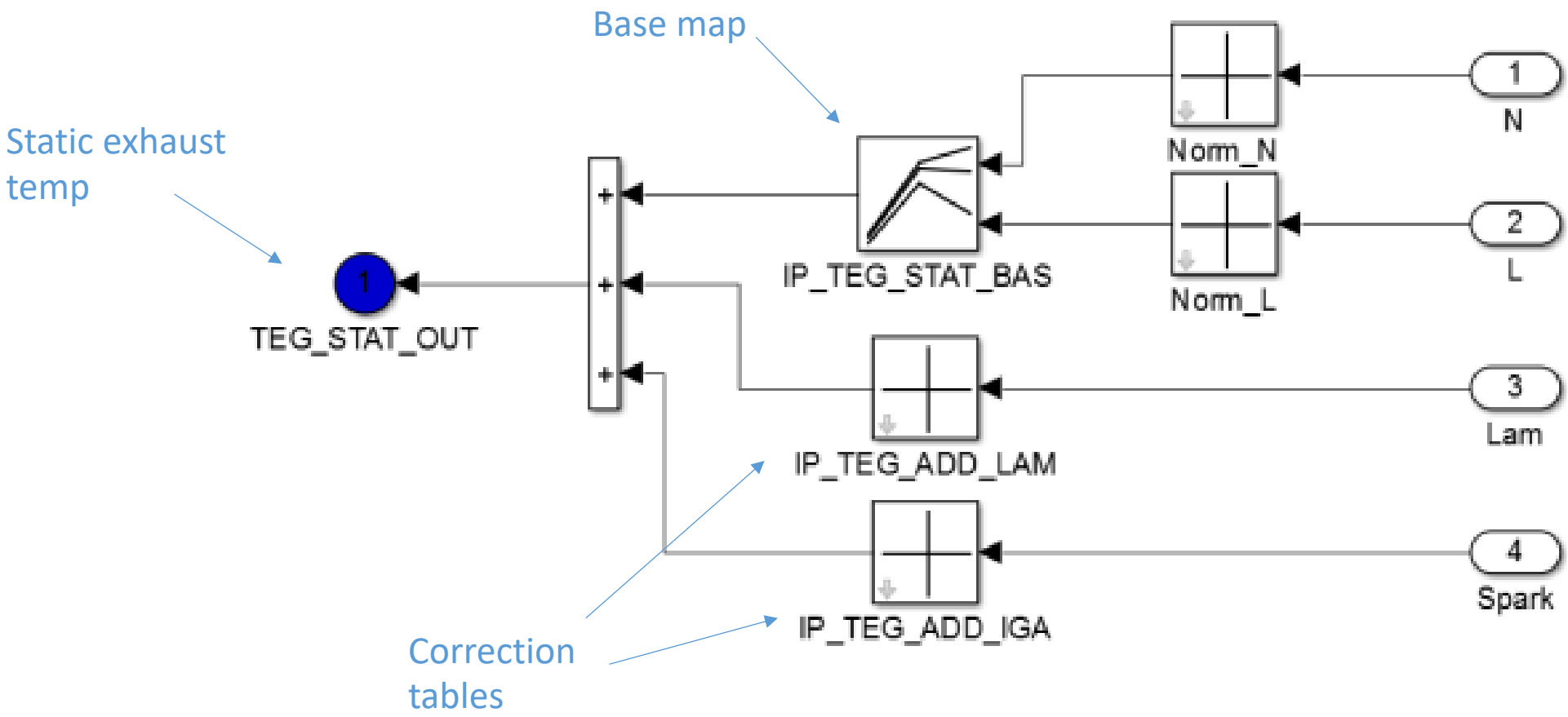
- □ Lesson 4 – Engine modelling (v8 Engine Example)
- □ Lesson 5 – Feature Calibration (v8 Engine Example)
  - Set up models, features and strategy
  - Establish calibration tables
  - Calibrate a feature
- □ Lesson 6 – V8 Engine Trade-off Calibration ($BMEP_{mean}$ / $BMEP_{var}$)
- □ Lesson 7 – PI Controller Calibration (optional)

Lesson 5 - Exhaust Temperature Model (simplified)

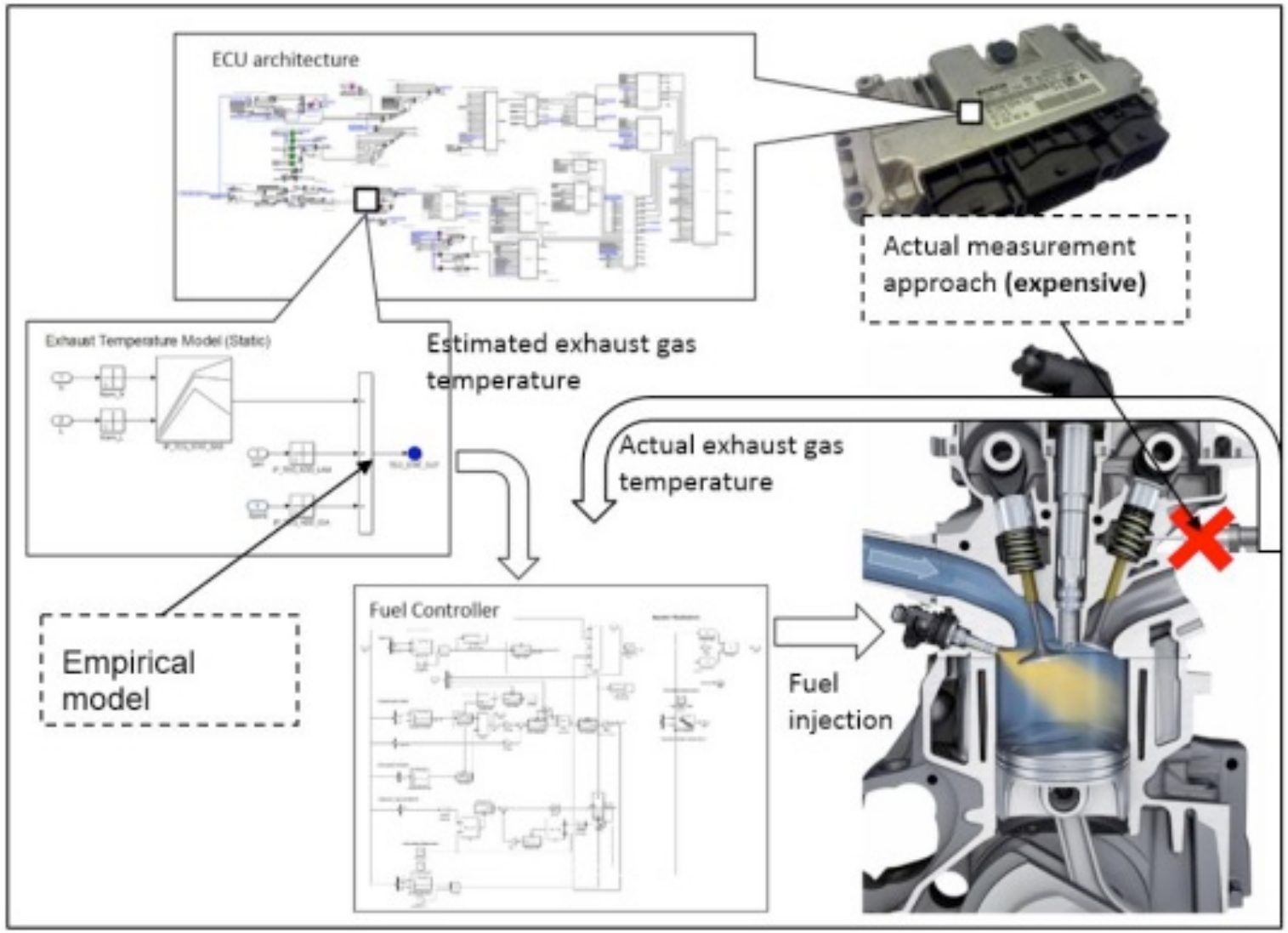
- The aim of this exercise is to fill in the tables in the ECU strategy using the exhaust temperature response model from **V8NA_1_StageModel.mat**, which was generated from the modelling workshop.



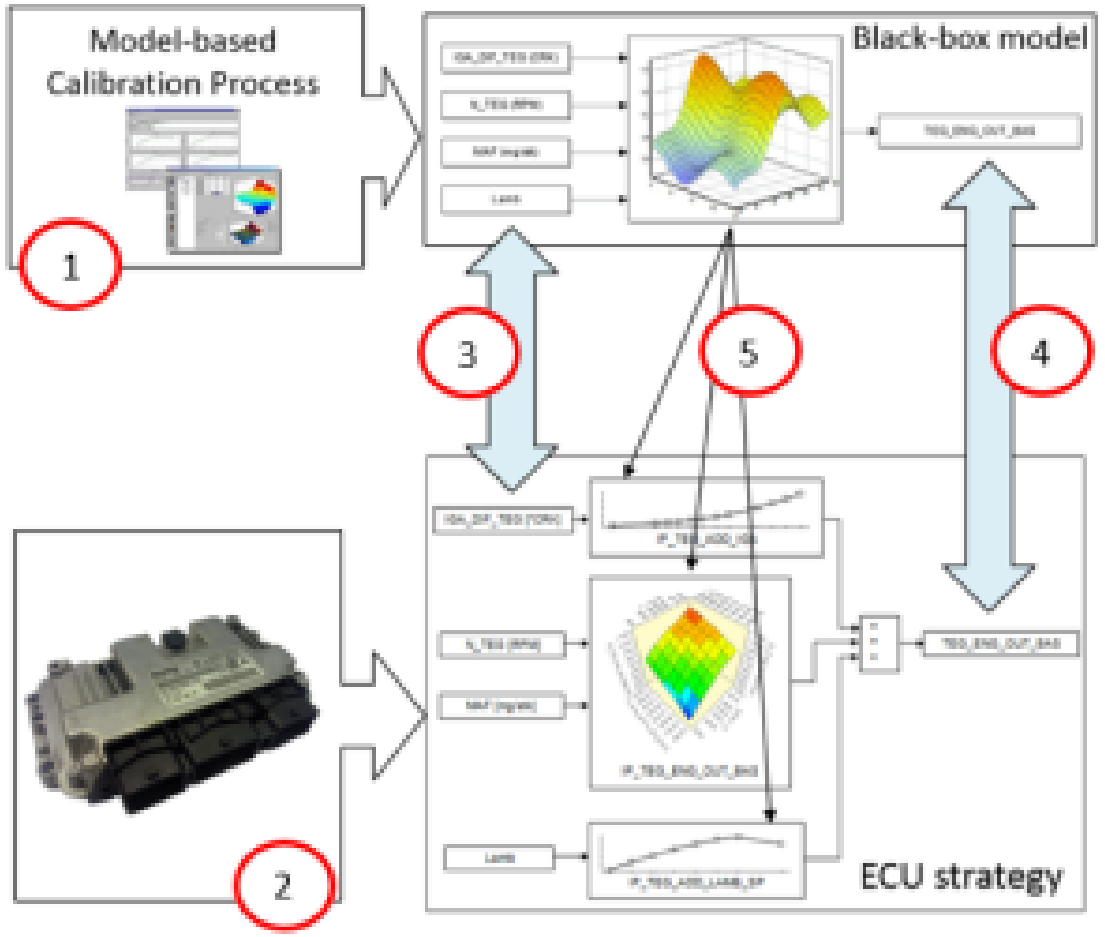
Lesson 5 - Exhaust Temperature Model (simplified)



Powertrain Calibration Optimisation



Powertrain Calibration Optimisation



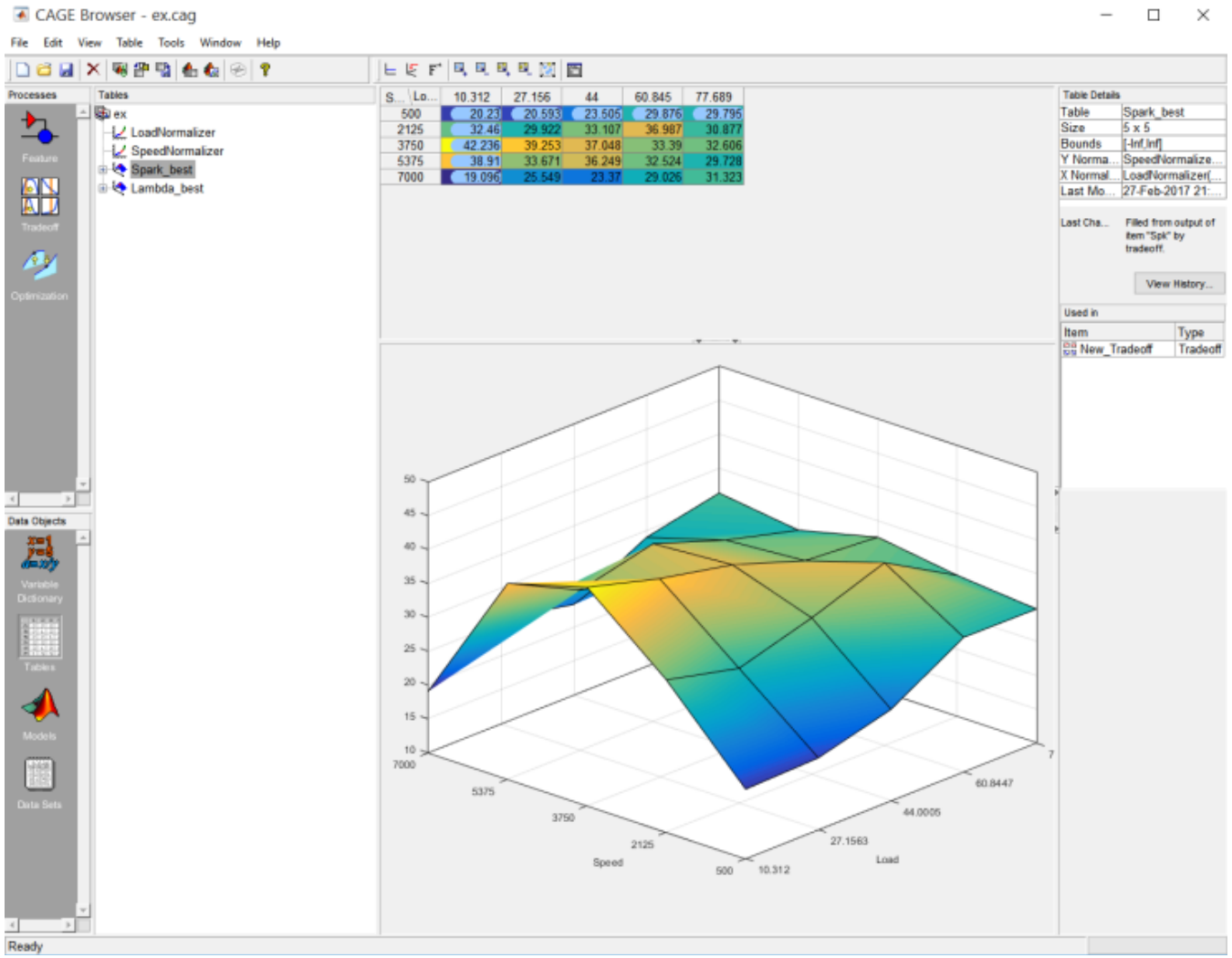
1. Model an engine response
2. Upload ECU strategy to CAGE
3. The table breakpoints are used as inputs values. The input values are introduced to the response model and the ECU strategy.
4. Both outputs from the response model and ECU strategy are compared. The process is iterated until both responses more or less similar.
5. The tables are filled in once the ECU strategy is capable of replicating the response model.

Lesson 6 – Calibration Optimisation

- The aim of this exercise is both to observe and to gain an understanding of the process of calculating engine control parameters.
- The exercise uses the data you have already seen during the modelling and Design of Experiments exercises.
- The work you completed in the DOE workshop will form the starting point for this exercise.
- You will use the CAGE tool (CAlibration GEneration) to conduct the analysis.
- CAGE is a Matlab toolbox that can be operated with also with a GUI.

Lesson 6

- Optimise for $BMEP_{mean}$ whilst minimising $BMEP_{var}$, subject to constraints of T_{exh}<800C.
- Compare a manual and ‘automatic’ approach



Lesson 7 - PI Controller Calibration

- The PI controller is used for controlling the injected fuel mass flow depending on the lambda set point input.
- The outcome of the automatic calibration process is a series of optimized gain scheduled tables for the fuel PI controller.

Lesson 7 – PI Controller Calibration

- PI Controller Calibration
  - Fuel controller